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ABSTRACT

Scholastic Aptitude Test (SAT) scores of Asian, Hispanic, Black, and White students with similar socioeconomic backgrounds and access to similar instruction in the same large midwestern school district were compared. Income levels were determined by using federal guidelines for free and reduced school lunches. The population of the study consisted of 3,734 White students, 361 Black students, 58 Hispanic students, and 59 Asian students in the average-to-high income groups. Average-to-low income groups contained 80 White students and 139 Black students. A two-way multivariate analysis of variance (MANOVA) and a one-way MANOVA examined four null hypotheses in the 0.05 level of significance. The Scheffe' post hoc multiple comparison method was used along with eta-squared tests for complete data analysis. Mean SAT-verbal and mathematics scores for high-and-low income Blacks were lower than mean scores for Whites in either category. High-income White, Asian, and Hispanic students showed no significant difference in SAT-verbal and mathematics scores, except SAT-mathematics scores for Hispanics were significantly lower than those for Asians. High-income Black students had significantly lower SAT-verbal and mathematics scores than other groups. Five tables present study findings.
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THE EFFECT OF SOCIOECONOMIC LEVELS AND SIMILAR INSTRUCTION ON SCHOLASTIC APTITUDE TEST SCORES OF ASIAN, BLACK, HISPANIC, AND WHITE STUDENTS

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ABSTRACT

The purpose of the study was to compare Scholastic Aptitude Test scores of Asian, Hispanic, Black, and White students having similar socioeconomic backgrounds and having access to similar instruction within the same large midwestern school district. Income levels were determined by using federal guidelines for free and reduced school lunches. The population in the study consisted of 3,734 White students, 361 Black students, 58 Hispanic students, and 59 Asian students in the average-to-high income groups. Average-to-low income groups contained 80 White students and 139 Black students.

A two-way MANOVA and a one-way MANOVA examined four null hypotheses at the .05 level of significance. The Scheffe post hoc multiple comparison method was used along with eta-squared tests for complete data analysis.

Mean SAT-verbal and math scores for high and low income Blacks were lower than mean scores for Whites in either category. High income White, Asian, and Hispanic students showed no significant difference in SAT-verbal and math scores, except SAT-math scores for Hispanics were significantly lower than those for Asians. High income Black students had significantly lower SAT-verbal and math scores than the other groups.

The Scholastic Aptitude Test, hereafter referred to as the SAT, was developed in the early 1900's to assist college administrators in the selection process of student applicants. Hanford (1991) described the SAT as an objective test which measured a student's verbal and mathematical ability.

Claims of bias have risen steadily as greater numbers of minority and low-income students take the SAT. Some researchers contended the SAT prevents many minority and low-income students from being admitted to college (Crouse & Trusheim, 1988). Slack and Porter (1980) described the SAT as a third-rate predictor of college performance. The study showed that successful training can occur for the SAT, thus affecting its validity. Relationships between SAT analogy item difficulty and ethnic groups have been shown in recent studies (Kulick & Gillian, 1989; Freedle & Kostin, 1987).

Other studies have focused upon the predictive efficiency of the SAT. Fincher (1974) concluded that the SAT, over a 13 year period, increased the predictive efficiency, in relative terms, of college success by 46% for males and 43% for females over the use of high school grades alone. Jensen (1980) suggested that adverse conditions existed in most Black samples regarding differential validity of the SAT. The study contended, however, that the validity coefficients obtained were generally quite comparable to

those obtained by White test takers. Hanford (1991) challenged claims of bias in the SAT by suggesting that those who use it may discriminate against minorities, but the test itself is not biased toward minority students. The creators of the SAT contended that the test merely indicated who would do well in an average American college setting.

METHOD

The study compared Scholastic Aptitude Test scores of majority and minority students having similar socioeconomic backgrounds and having access to similar instruction within the same school district. By controlling the variables of ethnicity, family income, and instructional preparation, several debated issues regarding the SAT have been studied.

SAMPLES

Subjects in the study were students in the same large midwestern school district. The students attended one of six high schools in the district. The majority of students previously attended primary schools in the district as well. Each student took the SAT between the years 1987 and 1991. Hispanic, Asian, Black, and White students were included in

the study. Income levels were established by requests for free or reduced meals and/or for textbook assistance. If students qualified for free or reduced lunches (or textbooks), they were categorized in the average-to-low income level (less than $24,790 annually for a family of four). If students did not qualify for free or reduced lunches, they were categorized in the average-to-high income level (greater than $24,790 annually for a family of four). The groups compared were average-to-high income Whites, Blacks, Hispanics, and Asians. Additional groups contained average-to-low income Whites and Blacks. There were too few average-to-low Hispanics and Asians for comparison. The average-to-high income group contained 3,734 Whites, 361 Blacks, 58 Hispanics, and 59 Asians. The average-to-low income groups contained 80 Whites and 139 Blacks.

STATISTICAL PROCEDURES

The Educational Testing Service, hereafter referred to as the ETS, supplied the raw data regarding SAT-verbal scores and SAT-math scores for each test taken during the given years. Permission was obtained from the school corporation officials to receive these scores matched to newly-assigned student numbers. The ethnicity of each student was then

obtained and data regarding free and reduced lunch requests were then matched to the students according to the new student numbers. No individual names or identities were released. The entire population of students was used to construct cell sizes as previously indicated.

The null hypotheses examined in the study corresponded to the two-way multivariate analysis of variance (MANOVA) and the one-way multivariate analysis of variance (MANOVA) used in the data analysis. The MANOVA was used because there were two dependent variables of SAT-verbal scores and SAT-math scores. The Hotelling multivariate test of significance was utilized in both examinations. The sampling distributions for these test statistics were the F distributions. The .05 level of significance was used in both tests. There were three null hypotheses studied in the two-way MANOVA involving only Black student scores and White student scores.

Those hypotheses were as follows:

I. There is no difference in the mean SAT-verbal scores and SAT-math scores of Black students and White students attending the same large midwestern school system.

II. There is no difference in the mean SAT-verbal scores and the mean SAT-math scores of the average-to-high and average-to-low socioeconomic groups consisting of Black and White

students attending the same large midwestern school system.

III. There is no interaction between ethnicity and socioeconomic levels regarding SAT-verbal and SAT-math scores of Black students and White students attending the same large midwestern school system.

There was one null hypothesis examined in the one-way MANOVA involving only the average-to-high socioeconomic students from the Black, White, Asian, and Hispanic groupings. The hypothesis was as follows:

IV. There is no difference in the mean SAT-verbal scores and SAT-math scores of Black students, White students, Asian students, and Hispanic students who have an average-to-high income level, greater than $24,790 annually for a family of four, and attend the same large midwestern school system.

After this null hypothesis was rejected, the Scheffe post hoc multiple comparison method was used to determine which pairs of scores had significant difference. Eta-squared tests were used in both MANOVA tests to determine the percent of variance in the dependent variables explainable by the difference in the groups. An indication of the actual strength of effects was obtained, over merely reporting significance, by using the eta-squared tests (Kennedy & Bush,

1985).

Hypothesis I was rejected at the .05 level of significance. Univariate F-tests were used to test which dependent variable showed significance. The SAT-verbal scores had probability of $<.001$ and the SAT-math scores had probability of $<.001$. Thus, a significant difference in scores followed ethnic lines.

Eta-squared tests showed a value of 8.83 percent of the variance in SAT-verbal scores was explainable by the difference in the groups and 7.53 percent of the variance in SAT-math scores was explainable by the difference in groups.

Hypothesis II was rejected at the .05 level of significance. The MANOVA results indicated that significant difference in both SAT-verbal scores and SAT-math scores followed socioeconomic levels for Black and White students. The Hotelling's multivariate test of significance indicated probability of $<.001$. Using univariate F-tests, SAT-verbal scores showed probability of $<.001$ and SAT-math scores showed probability of $<.001$. Thus, both were significant at the .05 level of significance.

Eta-squared tests indicated a value of 2.57 percent of the variance in SAT-verbal scores was explainable by the difference in socioeconomic levels and 2.26 percent of the variance in SAT-math scores was explainable by the difference in socioeconomic levels.

Hypothesis III was not rejected. The MANOVA examining the interaction of ethnicity and socioeconomic level was not significant at the .05 level of significance. The test of significance indicated the probability was .065. Thus, any difference due to ethnicity was independent of socioeconomic levels, and any differences due to socioeconomic levels was independent of ethnicity.

Hypothesis IV examined Black, Hispanic, White, and Asian student SAT scores within the average-to-high income level. There were too few scores from average-to-low income Hispanic students and from Asian students for purposes of comparison. Thus, comparisons were limited to average-to-high income students in the four ethnic groups.

Hypothesis IV was rejected at the .05 level of significance. A one-way MANOVA was used to determine significant difference. Probability of .001 was found for both SAT-verbal scores and SAT-math scores. Table 1 and Table 2 represent the cell means and standard deviations from the described variables.

Table 1

Cell Means and Standard Deviations for the Variable SAT-verbal Scores for High Income White Students, Black Students, Hispanic Students, and Asian Students

Factor	Code	Mean	SD	N
Ethnicity	White	435.61	96.58	3734
Ethnicity	Black	352.60	86.41	361
Ethnicity	Hispanic	415.52	102.91	58
Ethnicity	Asian	444.75	130.77	59

Table 2

Cell Means and Standard Deviations for the Variable SAT-math Scores for High Income White Students, Black Students, Hispanic Students and Asian Students

Factor	Code	Mean	SD	N
Ethnicity	White	487.15	113.42	3734
Ethnicity	Black	395.37	96.99	361
Ethnicity	Hispanic	457.41	119.98	58
Ethnicity	Asian	526.78	145.61	59

The Hotelling's multivariate test of significance was used to determine significant difference among the four ethnic groups regarding mean SAT-verbal scores and SAT-math scores. Significance was found at the .05 level and the univariate F-tests indicated significance in both SAT-verbal scores and SAT-math scores at the .05

level. The probability shown was <.001 in all areas. Table 3 lists a summary of the MANOVA with regard to the effect of ethnicity including all four ethnic groups studied.

Table 3

Summary of the Ethnicity Effect Involving SAT-verbal Scores and SAT-math Scores of High Income White Students, Black Students, Hispanic Students, and Asian Students

Hotelling's Multivar. Effect .. 4 Ethnic groups

Approx. F	Hypoth. DF	Error DF	Prob.
49.06	6.00	8412.00	.000

Univariate F-Tests

Source	DF	SS	MS	F	Prob.
SAT V					
Ethnic	3	2293483.30	764494.43	82.26	.000
Error	4208	39104615.84	9292.92		
SAT M					
Ethnic	3	2933730.75	977910.25	76.98	.000
Error	4208	53459413.10	12704.23		

Eta-squared tests were run on the dependent variables of SAT-verbal scores and SAT-math scores. A value of 8.47 percent of the variance in SAT-verbal scores was explainable by the difference in groups and 7.43 percent of the variance in SAT-math

scores was explainable by the difference in groups.

With significant difference found between groups, the Scheffe post hoc multiple comparison test was used to determine which pairs of means differed significantly. Mean SAT-verbal scores and mean SAT-math scores of Black students were found to be significantly lower at the .05 level of significance as compared to all other groups. Mean SAT-math scores of Hispanic students were found to be significantly lower than mean SAT-math scores of Asian students. With this exception, there was no significant difference between scores of White students, Asian students, and Hispanic students on their mean SAT-verbal scores or between their mean SAT-math scores. Tables 4 and 5 show the summary MANOVA for the post hoc multiple comparison test on SAT-verbal scores and SAT-math scores respectively.

Table 4

Summary MANOVA for the Scheffe Post Hoc Multiple Comparison Test on SAT-Verbal Scores by Ethnicity

Group	White	Black	Hispanic	Asian
Count	3734	361	58	59
Mean	435.6	352.6	415.5	444.7

Source	SS	DF	MS	F	Prob
Between	2293057.35	3	764352.45	82.25	.000
Within	39104523.20	4208	9292.90		
Total	41397580.55	4211			

Table 5

Summary MANOVA for the Scheffe Post Hoc Multiple Comparison Test on SAT-Math Scores by Ethnicity

Group	White	Black	Hispanic	Asian
Count	3734	361	58	59
Mean	487.2	394.1	457.4	526.8

Source	SS	DF	MS	F	Prob
Between	2934998.81	3	978332.94	77.01	.000
Within	53458432.00	4208	12704.00		
Total	56393430.81	4211			

RESULTS AND DISCUSSION

A classified sample of 3814 White students, 500 Black students, 58 Hispanic students, and 59 Asian students was used. Students had access to similar instruction and were classified into average-to-high and average-to-low income groups. Mean scores for Black students on the SAT-verbal and math sections were lower than for White students. When Black and White students were grouped together by income, average-to-high income students scored significantly higher than average-to-low income students. Mean scores of Black students in both income levels were lower than mean scores for White students in both income levels. Any difference in scores due to ethnicity was independent of socioeconomic levels, and any difference in scores due to socioeconomic levels was independent of ethnicity. Where average-to-high income Blacks, Whites, Hispanics, and Asians were compared, mean scores for Black students were lower than mean scores for the other three groups. White students' mean SAT scores were not significantly different from SAT scores for Asians or Hispanics. Mean SAT-math scores of Hispanic

students were lower than SAT-math scores of Asian students.

Several conclusions were drawn from the study.

1. Given access to similar instruction, Black students, as a group, do not score as well as White students on the SAT, regardless of socioeconomic levels.
2. As a group, average-to-high income Black students score better than average-to-low income Black students on the SAT, when given access to similar instruction.
3. As a group, average-to-high income White students score better than average-to-low income White students on the SAT, when given access to similar instruction.
4. Higher socioeconomic level influences SAT scores positively. However, Black students score lower than Asian students, Hispanic students, and White students when grouped in corresponding socioeconomic levels.
5. Any difference in SAT scores of Black and White students due to race is independent of socioeconomic level, and any difference in SAT scores of Black and White students due to socioeconomic level is independent of race.

6. Hispanic students score lower than Asian students on SAT-math sections when given access to similar instruction and similar socioeconomic background.
7. White students, Asian students, and Hispanic students have similar SAT scores when given access to similar instruction and grouped in corresponding socioeconomic levels.
8. SAT scores do not merely rank students by socioeconomic levels. Given access to similar instruction and grouped in corresponding socioeconomic levels, Black students score lower on the SAT than Asian students, Hispanic students, and White students.
9. The effect of ethnicity accounts for a higher percentage of the variance explainable by the difference in ethnic groups than does the percentage of the variance explainable by the difference in socioeconomic levels.

The study treated the data in a quantitative manner. Further empirical studies exploring the variables of the study, and others, might determine why significant differences in SAT test scores occur between certain racial and ethnic groups.

In addition, future studies should define socioeconomic status more clearly, and include low income Hispanic and Asian students.

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